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MUNICIPAL SUPPRESSION OF INFECTION AND CONTAGION.

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MODERN conditions of life, more especially in great cities, have brought to the medical scientist and sanitarian a multitude of new problems in hygiene. Many of these problems have already been solved, in great measure as a result of progress in bacteriological study. The knowledge of hygienic principles gained by the scientific world in recent years has made of an empiric study an exact one, has lengthened the span of existence for every civilized being, and has saved the state in human lives the equivalent of millions of dollars annually. Yet men are only beginning to comprehend the great possibilities for the promotion of the health of the world which lie in the study of preventive medicine. The city of Havana is a striking example of what can be done in a short time. Since the American occupation, its death-rate has been reduced to that of New York. The twentieth century is likely to see the "ounce of prevention" system displace more and more the "pound of cure" plan which has burdened previous centuries. Preventive measures seem to be progressing faster, in almost every direction, than disease can spread; and, as a result of knowledge in these matters, a number of once formidable ailments have quite lost their terrors for the physician. New discoveries in preventive medicine are constantly coming to light, and the world may one day have at hand a remedy for most, if not all, of the diseases which now afflict humanity.

No branch of medical learning has progressed faster than the study of the infectious diseases. Many diseases long suspected to resemble in their origin those known to be infectious and communicable, have been definitely determined to be such. Others,

which, within the lifetime of physicians still in active practice, were by none believed to be communicable, have been definitely established as belonging to the infectious class. In all research of this character, the bacteriologist has been the discoverer. The isolation of certain bacteria, each the cause of some disease, has by degrees established one after another disease as communicable. The next step was to note that patients who recover from many of the infectious diseases rarely contract them again. Upon this observation was based the theory that the human body itself acquires some antitoxin which not only kills the bacteria of the disease, but provides immunity against future attacks. When this theory was established beyond question for a number of the communicable diseases, the leaders in bacteriological study at once set about the artificial production of these mysterious immunizing agents. Success has rewarded their efforts in a sufficient number of instances to warrant the belief that all communicable diseases may one day be prevented in this way.

With all the facts which might be adduced to show the efficacy of preventive medicine, it seems strange that there are still persons who object to the use of serums in disease. A hundred years ago, it was regarded as only normal if smallpox, every year, was responsible for 150 out of every thousand deaths. Nowadays, however, under compulsory vaccination, smallpox claims only 5 or 10 in each thousand. What was begun with smallpox serum has been extended to other diseases. Between the epoch-making discoveries of Jenner and those of Pasteur and Koch, there was a lapse of eighty years, during which it may have seemed to the layman that no progress was made; but knowledge of various antitoxins is growing rapidly, and the successful use of three or four, in common employ now for several years, may be followed very soon by the production of other immunizing serums. At all events, the theory is established. Of the common forms of disease, it is true that the only complete success recently attained has been in the treatment of diphtheria; but in the last five years, the death-rate in cities using the serum has been reduced to less than one-half of the lowest death-rate recorded before the discovery of the diphtheria antitoxin. Partial success has been attained in inoculation against cholera and the plague; but for the two or three most fatal communicable diseases no satisfactory serum has yet been found.

In default of specific aid from the bacteriologist, the sanitarian turns to hygienic principles in order to prevent the spread of diseases. Especially is this true in the treatment of contagious diseases in the great cities. In the rural districts, where there is room for every man to move about without jostling his neighbor, where there is pure air for all, and where the standard of living is high enough to embrace some, at least, of the cardinal principles of sanitation, infectious diseases have less opportunity to gain a foothold. But in the cities, the public medical adviser has to care, among others, for a great tenement population—ill-housed, ill-nourished, bred in the foul air of the slums; above all, ignorant of the laws of cleanliness and of right living, and willing to go to any lengths to hide the evidences of disease from the municipal physicians. Such people know nothing of the causes of contagion and feel no responsibility if they spread disease; in fact, the very ones who from their situation should be most careful of the health of their neighbors, are really least so.

But the poor in tenements are more sinned against than sinning, for the greed of landlords often stands in the way of better housing for the people. In New York, the devoted labors of sanitarians interested in improving tenement conditions resulted last year in the passage of a law governing the construction of tenements, and requiring that they be built with more attention to the sanitary needs of their occupants. But, at the following session, the Legislature was besieged by greedy landlords, and it required all the efforts of the Tenement House Commission, seconded by the Board of Health, to prevent the passage of amendments which would have quite emasculated the law, and led to the construction, in the newer sections of the city, of a form of tenements calculated to perpetuate all the evils now existing in the older slums. While it is not generally known, it may be stated here that, in some of the older wards in New York city, there are acres of land which hold between 700 and 800 people each; the most thickly populated acre in the Old World, by way of comparison, is said to be one in Prague, which "accommodates" 485 people. The average density of population in the whole of Manhattan Island is greater than in any other city of the civilized world; that is because three-fourths of the population live in tenements, piled tier on tier to the skies.

It is an accepted fact that an increased death-rate is an almost

inevitable concomitant of increased density of population. The Registrar-General of England, some years ago, showed that, whereas the mean death-rate per 1000 in a district with only 166 persons per square mile was 16.75 per 1000, it was 38.62 per 1000 in a district where there were 65,000 persons per square mile. For the former section, the mortality of children under five years was 37 per 1000, while for the latter it was 139 per 1000—pitiful evidence, indeed, as to the expectation of life for the children of the tenements in our cities.

Extremely important in the suppression of contagion is a proper municipal supervision of the meat, milk, and water supply of the people. The extent to which this can be carried is shown by the fact that about ten million pounds of foodstuffs are annually seized and destroyed by the New York Board of Health. It is unnecessary to cite here the shocking disclosures of recent years with regard to the prevalence of tuberculosis in cattle, and the possible identification of human and bovine tuberculosis. Efforts to secure the destruction of tuberculous beef in the New York market, as well as to prevent the spread of the disease through the milk of infected animals, have resulted in a fairly satisfactory measure of co-operation between the New York Health Board and those of neighboring States; otherwise, it would have been impossible for the New York Board to exercise any control over sources of possible contagion outside its own jurisdiction. As it is, there is a careful inspection of all meat sent into the city, and carcasses found to be tuberculous are immediately destroyed.

Milk inspection, in the interest of a pure supply, plays an important part in efforts to check communicable disease. This inspection should be begun at the dairies and stables, where the bacteria found in milk first have an opportunity to breed. The milk ducts of a cow often give off thousands of bacteria to each cubic centimetre of milk; thousands of others are added in the process of milking, especially if the cow's udder and the attendant's hands are not clean. It is true that few of these bacteria are directly productive of communicable disease, but a number of kinds so modify the milk in their development as to render it injurious to the consumer. It is impossible to secure raw milk in any amount which is absolutely free from bacteria. The specifications for milk supplied to the contagious-disease

hospitals under the control of the New York Board of Health call for a milk which contains not more than 60,000 bacteria per cubic centimetre, except in the months of May, June, July, and August, when the limit is 100,000 bacteria per cubic centimetre; milk of this standard is of recognized high quality. All milk dealers in New York city carry on business under permits revocable at the pleasure of the Health Board. Infectious diseases, not only tuberculosis, diphtheria, scarlet fever and typhoid, are not infrequently transmitted in milk which has been contaminated either at the dairy or in the stores of retailers where disease has occurred. It is important that the vender shall not keep or store milk in any room used for sleeping or domestic purposes, or opening on such rooms. Stringent rules must also be enforced regarding the transfer of milk from cans to bottles on streets or at ferries or depots, and for the protection of milk receptacles from the dust and impurities of streets.

Contamination of milk with typhoid germs results from the use of infected water in washing the cans or other utensils. But typhoid fever is more commonly transmitted by the direct contamination of water supplies. The health authorities of New York city long since stopped the use of all shallow wells on Manhattan Island, but typhoid outbreaks still occur in localities where the water used by the inhabitants is subject to sewage contamination. Notable in this respect was the outbreak in Philadelphia four years ago; about three times the usual number of cases of typhoid were recorded during the epidemic, and of these some 65 per cent. were found in a section of the city containing only one-fifth of the total population. On tracing the sources of infection, it was found that all these cases were due to the accidental overflow of a sewer into the Schuylkill River at a point just above the intake of one of the reservoirs. The lesson is obvious, especially when sanitarians recall that in cities like Munich or Vienna, which draw their waters from pure mountain springs, the deaths from typhoid number only four in each 100,000 of population, while in cities like Philadelphia, Washington, Albany, Pittsburg, Cincinnati, and Louisville, which still use water from wells in populous districts, and from rivers known to be polluted with sewage, the death-rate from typhoid averages sixty per 100,000 inhabitants.

Perhaps the greatest opportunity which is offered to the mu-

municipal sanitarian to promote the health and happiness of mankind, lies in measures to prevent the spread of tuberculosis; but, unhappily, there is no opportunity to which cities have been so blind. Municipal governments in the United States which have thus far adopted effective prophylactic systems may be numbered on the fingers of one hand, and this in spite of the fact that the medical profession is already well aware of the wonderful results which follow radical preventive measures.

Tuberculosis takes away from a quarter to a third of the persons who sicken and die during the best and most productive period of life; and yet it has been shown in New York city, to go no further afield, that the spread of this disease is readily preventable, if proper hygienic measures are taken. The hygienic measures, when fitly practised, should cover all the places where consumptive persons may have been—the home, the public conveyance, the factory, the store, and even the public streets. The plan of safeguarding the general public against tuberculosis, as it is now in operation in New York city, has already produced such remarkably good results that it is difficult to see how any important city in the land can fail to adopt similar, or even more rigorous, measures. The ordinance which brought pulmonary tuberculosis under the control of the New York Board of Health was not adopted until 1897, although recommended nearly ten years prior to that time. The disease was then declared infectious and communicable, and every physician in the city was required to report in writing the name, address, occupation, etc., of every person suffering from tuberculosis, who had come under the observation of the physician. Furthermore, every person suffering from the disease, and every person in attendance upon any one so suffering, was by this ordinance required to observe and enforce all the rules of the Board of Health which aim to prevent the spread of tuberculosis. The adoption of the compulsory notification requirement raised a storm of protest from the various medical bodies in New York city, but without avail; and the results have already shown the wisdom of the procedure, while all the leading physicians are now heartily in accord with the plan.

Compulsory notification is the keynote of the system. It gives opportunity at once for the necessary sanitary measures. Inspectors from the Board of Health are enabled thus to visit tene-

ment houses, lodging-houses, hotels, etc., and instruct the consumptives as to the necessary precautions to be taken for their own good, as well as for the safety of persons about them. Disinfection, and what is still more efficacious, complete renovation of all premises where a death from tuberculosis has occurred, are, when necessary, ordered by the Board of Health; and advanced cases are moved to hospitals (with their own consent) so far as it is possible to provide hospital accommodations. Many opportunities also arise for the removal to rural sanitariums of persons who have recently contracted the disease. In this way the Board of Health is able to follow up each tuberculous case at the home, or the workshop, factory, or office, and protect the patient's neighbors from infection. Registration facilitates satisfactory supervision over the disease, and helps the Board of Health to discern where the chief efforts should be put forth. For example, it has thus been shown that, in several separate blocks in the lower part of the city, more than one hundred cases of tuberculosis have occurred within five years; and there are certain houses in New York which have had between twenty and thirty cases in that time. One of the blocks in the Chinese quarter, with a population of 2100 persons, had more than 200 cases of tuberculosis in five years; and it is likely that the number reported would have been larger had the system of registration then been as complete as it is now.

In addition to the inspection and renovation of houses where tuberculosis cases have occurred, much is being done to restrain people who spread infection by constant expectoration. It has been shown conclusively that a spitter who is suffering from a disease of the respiratory tract may, if allowed to continue his operations without control, provide infective material for hundreds, if not thousands, of persons during the slow progress of his disease. It seems probable that a number of diseases besides consumption are transmitted in this way. It is for this reason, even more than on the score of public decency, that drastic measures are taken to restrain the man who spits in public places. In New York, the practice is to send out police officers dressed in citizens' clothes to arrest all persons found spitting in public conveyances. The spitter, as a rule, evinces violent opposition to arrest, and seems to think that it is an infringement on his personal liberty. Especially is this true of the large foreign-born

element in New York's population. All are treated alike, however, when they are brought before the magistrate; and it is customary to fine them between one and ten dollars when they are taken in the act. In the long run, this system of arrest and fine will probably accomplish the objects sought, as no violator of the law can tell when he may be caught and arrested. It is noticeable that, so far as is known at this time, no spitter has ever been taken in a second offence, so that in all probability the lesson of arrest and punishment is an effective one.

The mortality from tuberculosis in New York city has been reduced about 35 per cent. in the last fifteen years, chiefly as a result of preventive measures, though these are as yet in their infancy. A satisfactory system of caring for tuberculous patients would include municipal sanitariums in favorable locations outside the city; but this enterprise seems to need the aid of a Carnegie or a Rockefeller, for city authorities are not yet willing to undertake the expense involved. The disease now costs New York city annually from nine to ten thousand lives, the value of which, according to the statisticians, is fully ten million dollars. It has been said by the best authorities that an extension of prophylactic measures—to include suitable hospitals and complete enforcement of the existing regulations—would result in the saving of from 2000 to 3000 lives annually in New York city. The cost of this work would be extremely small, probably not a hundredth part of what New York is spending on rapid transit, bridges, schools, and similar public improvements.

Of prime importance in the suppression of contagion in all its forms is an efficient system of medical inspection in schools. As practised in New York city, this work is under the care of a special corps of physicians, detailed to visit the schools, and examine all children who have been isolated by the teachers as not appearing entirely well. The scope of this work may be imagined when it is said that a total of nearly 100,000 visits are made annually to the public schools, in the course of which upwards of 125,000 children are examined, and from 10,000 to 15,000 excluded as having contagious disease in one form or another. A large proportion of the contagious-disease cases occurring in New York, however, are reported by private practitioners, who are visited with censure and sometimes with fines for failure to make such reports. Diagnosis of each individual case follows, and the

patient is either removed to a contagious-disease hospital, or placed in charge of a district inspector, whose duty it is to watch the progress of the case, and take measures to prevent the spread of the disease to other persons in the neighborhood. The results of the preventive system in recent years have been profoundly important. The death-rate in the diseases to which children are especially subject shows a remarkable shrinkage. Especially is this true in diphtheria and croup, the mortality from which had been quite steadily increasing in New York up to the year 1895. At that time began the treatment with diphtheria antitoxin, and since then the mortality from diphtheria has been reduced fully one-half—a saving of several thousand lives every year.

Any review, however cursory, of measures for the suppression of contagion would be incomplete without a word about the checking of smallpox, which has been so prevalent in the United States in the last two years as to be almost epidemic. Its spread has been unquestionably due to laxity in vaccination work in various sections of the country. Contagion was brought here from Europe in considerable amount in 1900, and the disease has since been spreading, in the winter months, to a large number of the unvaccinated. Federal control of preventive measures is needed to secure a uniform enforcement of them; at present, the work of any particular city in checking smallpox is in great measure nullified by the laxity of other cities. The prevalence of the disease has revived discussion of plans for compulsory vaccination. There is no doubt of the efficacy of that system; an example of it is found in the course of smallpox in a state like Prussia, where, since compulsory vaccination was put into practice twenty-five years ago, the death-rate from smallpox has fallen from 36 per 100,000 to 0.49 per 100,000 inhabitants. At the same time, there has been so little opposition to vaccination in New York city that compulsion by State enactment has been deemed unwise. It seems probable that in the last two years fully one-third, if not one-half, of the population of New York has submitted to vaccination, and the good results of this are likely to be seen next winter, if they are not already apparent.

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